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Sabina Hajiyeva
Azerbaijan University of Architecture and Construction, Azerbaijan
Saverio Mecca
University of Florence, Italy

Azerbaijan is notable for its architectural and archaeological monuments. Architectural monuments preserved up to the present day represent valuable information on the succession and progress peculiarities of typologically different buildings. The diversity of architecture and details, construction methods and decoration of corbelled domes in this region, situated in a region between the East and the West, has considerable importance in a wider scenario.

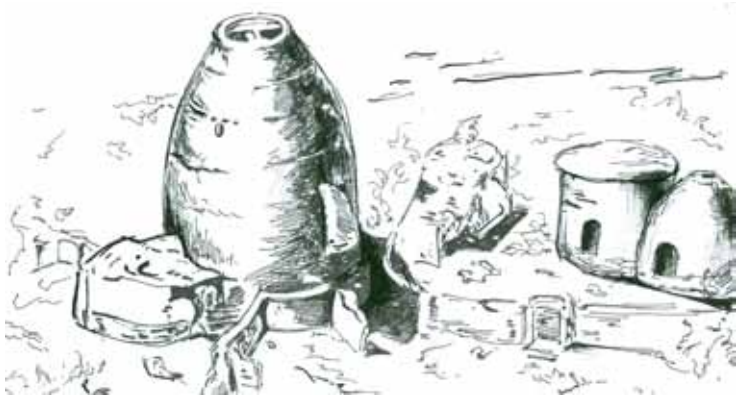


Fig. 2: Corbelled erections in immemorial settlements (Reconstruction)

Geography, natural environment, socio-economical context

Variety and abundance of natural-climatic conditions has contributed to the development of Azerbaijan's territory since ancient times: Azykh cave (Fizuli region of Azerbaijan), where eleven cultural layers belonging to different historical stages were discovered during archaeological excavations, is testimony to that. Such a variety of conditions posed differing architectural-construction problems for architects, creating a large number of varying types in the architecture of dwelling houses.

Peculiarities of historical development in various regions of Azerbaijan influenced the appearance and the spread of different architectural types. Considerable seismic activity in several regions of the country has influenced construction methods also. Thus, local building materials, seismicity of the region, insulation, etc., all interacted on the architectural, artistic and constructional peculiarities of Azerbaijan's corbelled architecture.

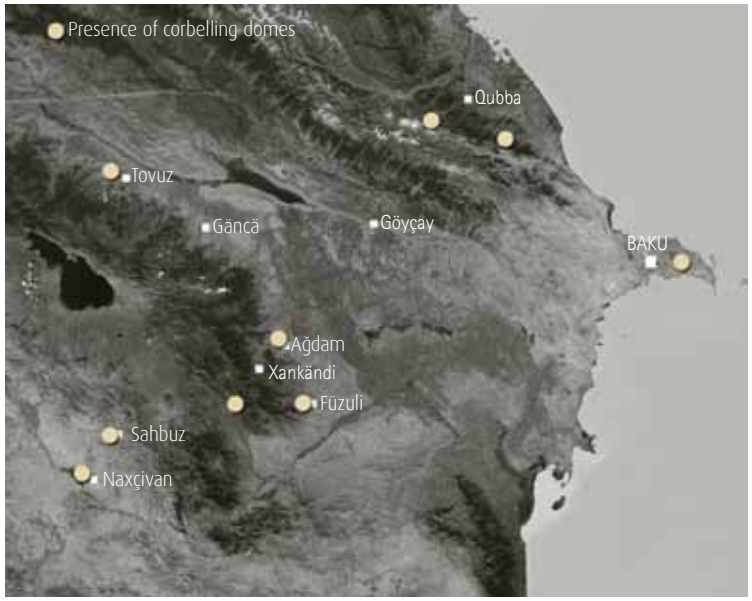
Fig. 1: Family houses of Bronze Age

Urban and architectural morphology and function

The ability of local architects to adapt the volumetric and planning composition of dwelling houses to local conditions and materials clearly demonstrates a certain level of local architectural and artistic development. Family houses (Fig.1) from the Bronze Age, discovered during archaeological excavations, as well as cave dwellings, are the most ancient dwelling type. Judging by a great amount of the immemorial settlements (6th-1st millennium BC), dwellings of that period were corbelled and round in layout. There were also several rectangular ground erections and semi-dugouts.

Mud brick or cobblestone in combination with a rammed loam structure was used as building material. Such buildings had the aperture in their upper part

Fig. 3: Distribution of corbelled domes



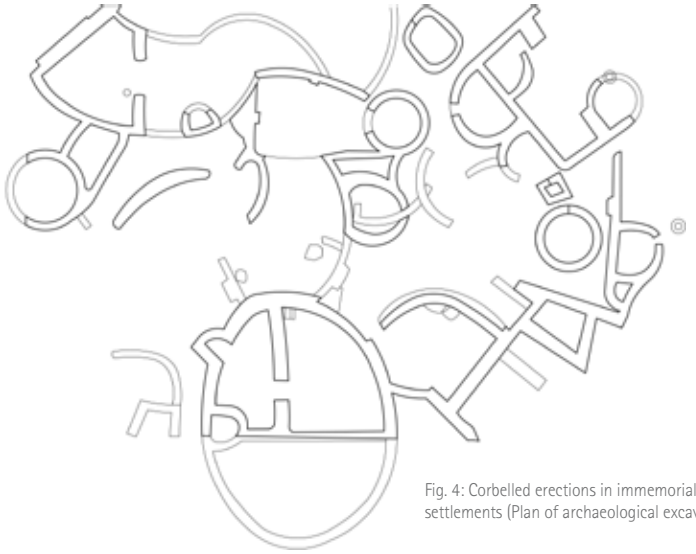


Fig. 4: Corbelled erections in immemorial settlements (Plan of archaeological excavation)

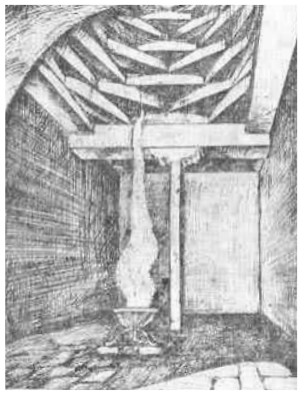


Fig. 5: Interior of ancient Garadam with wooden overlapping structure over fireplace

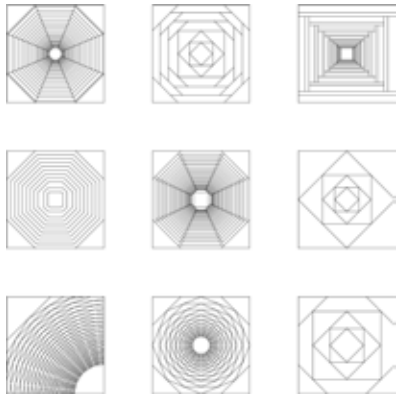
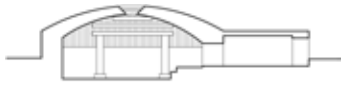


Fig. 6: Different types of overlapping structures



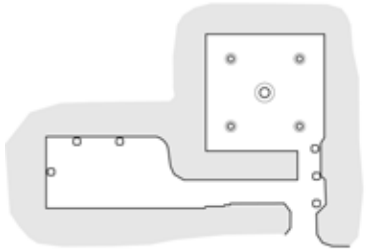


Fig. 7: Underground bi-cameral (segmental) garadam

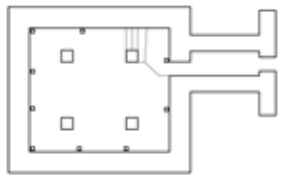


Fig. 8: Semi-underground unicameral garadam

over the fireplace, situated in the center of room (Gargalar tepesi, Gazakh region, 5th-4th mill. BC; Karakepektepe, Fizuli region, 3rd mill. BC; Gul-tepe, Nakhichevan, 5th-4th mill. BC; Ilanly-tepe, Garabakh, 5th mill. BC; Shomu-tepe, 6th-5th mill. BC) (Figs. 2-4). Dwelling walls were clayed using minced straw for increased durability and floors were strewn with gravel (Mamed-zadeh 1983). Iron Age dwellings were mostly of the *Garadam*[1] type, one of the most ancient kinds of housing. *Garadam* is a dwelling with a wooden corbelled dome, supporting columns (or without), an upper light-smoke aperture (*badja* in Azeri language) and a fireplace (*tendir*) in the middle of the room (Fig. 5). The main feature of *garadam* is the overlapping structure where the wooden corbelled dome (Fig. 6), with an upper light-smoke aperture in the middle of the roof, is formed by the forces of horizontally laid beams and timbers. A solid floor from converted timbers, small-scale branches and a dense earth bed is laid over the overlapping structure.

The name *garadam* may originate from the Turkish as *garanligdam*, 'dark house', or without windows. It can otherwise be translated as 'large house' (Mekhtiyev 1987, p. 8).

We may identify 3 types of *garadam* in Azerbaijan:

- underground *garadam* (Fig. 7),
- semi-underground *garadam* (Fig. 8),
- above ground *garadam* (Figs. 9-12).

Above ground *garadams* were more widespread than others. The existence of only one aperture (a door) demonstrates that the underground type was the first, semi-underground and above ground *garadams* being developed later. One could suppose that *garadam* is an upgraded dugout, with the burial mound remaining outwardly (Useynov 1963, p. 6). The house with its wooden roof supported with inner pillars could be cited as one of the most ancient houses in Transcaucasia.[2]

As a result of deep embedding of underground *garadams*, the entrance was like a narrow, covered and inclined corridor. The *garadam* itself remained a modest earthen mound. Interiors of *garadams* were very simple: walls were usually faced with coarse masonry; black smoke in the course of time covered the supports and beams with a solid, dark, sparkling tint.

Change of social-economical conditions and gradual thinning of forests caused the appearance and development of new progressive dwelling types,

[1] Garadams existed in some regions of Azerbaijan up to 19th century
[2] The region was described by Xenophon (5-4th centuries BC), and later by Vitruvius.

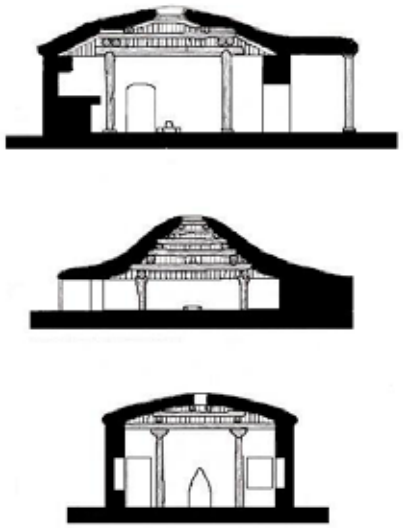
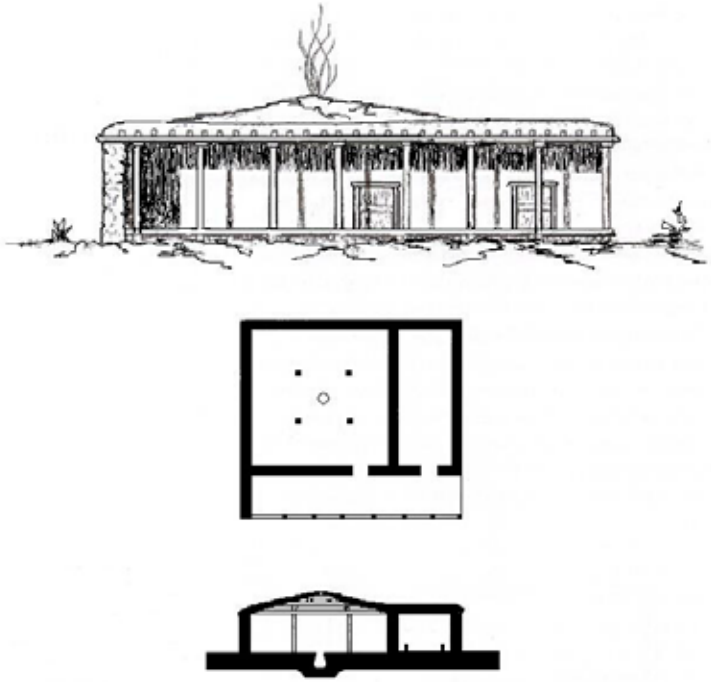


Fig. 9: Above ground unicameral garadams

Fig. 10: Bi-cameral (segmental) garadam



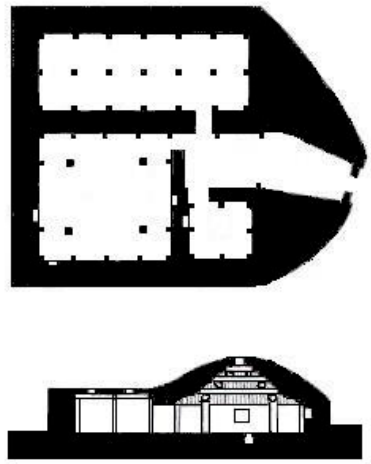


Fig. 11: Tri-cameral garadam

Fig. 12: Multicameral (complex) garadam

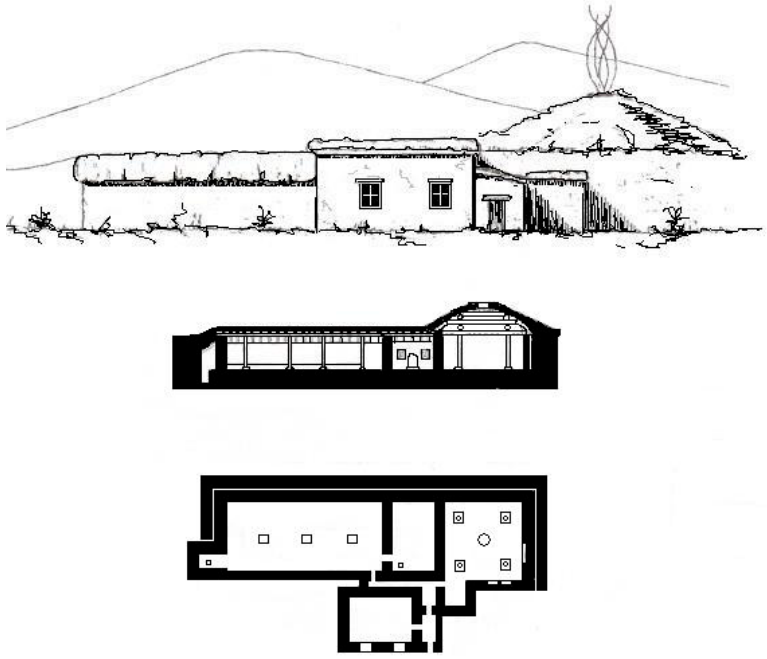


Fig. 13a: Djūma mosque in historical part of Baku- Icheri sheher

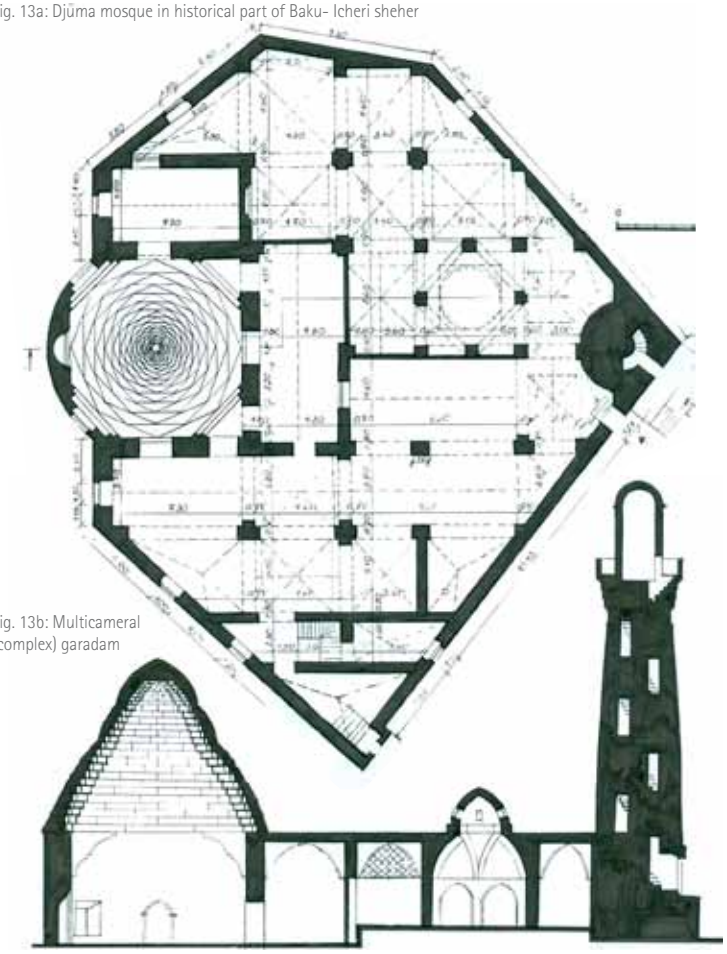


Fig. 13b: Multicameral (complex) garadam

Fig. 14: Djuma mosque in historical part of Baku- Icheri sheher

where only the back and partially the side walls were cut into the hillock. The overlapping structure was the same but without any internal supporting column and a facilitated construction. The main lower square of the corbelled dome was supported by walls. The upper aperture was for lighting only; smoke was allowed to escape via a special smoke duct.

A classification of garadams

Through a comparative analysis of all surviving garadams, we may propose the following classification:

- unicameral house (where people live together with animals under a single roof) (Figs. 8-9);
- bi-cameral (segmental), where living quarters are separated by a partition from the cattleshed (Figs. 7-10);
- tri-cameral house (Fig. 11) consisting of two cattle sheds and a living room;
- multicameral (complex) house (Mekhtiyev 1987 p.15) (Fig. 12).

A unicameral *garadam* house has a corbelled dome resting on 4 (or 3 or 2) self-supporting inner columns.

Two different wooden vault structures, rectangular and multi-angular (Fig. 5), were used in the overlapping of such a *garadam*. This type is similar to the Greek *megaron* (Mekhtiyev 1987, p.13). Other *garadam* types (bi-cameral-segmental and tri-cameral or multicameral) also included different utility rooms: cattleshed, granary, etc.

We must note that *garadam* type overlapping was used not only for dwellings but in religious buildings as well. Djuma mosque in the old town of Baku, Icheri Sheher, was built in the place of two temples dedicated to fire (Fig. 13) (results of archaeological excavations: Useynov 1963, p. 36). A corbelled dome, ornamented with blue and green slip glaze, can now be seen in old photographs from the 19th century (Fig. 14). Unfortunately, that mosque was burned down and another mosque (which exists now) was built in its place.

Garadams at Absheron peninsula. The Village of Gala

Absheron peninsula is of especial interest as a region rich in architectural heritage: the history of Absheron began long before the AD period. Burial mounds of 3rd-2nd millennium BC discovered during archaeological excavations and the rock petroglyphs of Gobustan demonstrate the deep historical roots of that area.

Unfortunately *garadams* have been preserved only in a few villages of

Fig. 15b: Houses in Gala Village, unicameral type

Fig. 19: detail of corbelled dome in Gala Village

Fig. 20: detail of corbelled dome in Gala Village

Fig. 17b: House in Gala Village, double-domes type

Azerbaijan. One of such village is Gala[3], situated in the north-east of the Absheron peninsula. It is different from the other Absheron villages for its unique architectural character. The architecture of the village of Gala corresponds to the Absheron traditional architectural features, which were connected first of all to natural factors: lack of timber but large quantity of limestone, cold winds in winter and hot, dry winds in summer, lack of water sources, etc. Archaeological excavations are testimony to the existence of pre-historic settlements in this area dating from the 3rd millennium BC. However, dwellings and utility buildings preserved today could date from the 14th-19th centuries.

The village's territory is over 200 ha. There are 5 mosques, 3 bath houses (*hamam*), 4 water reservoirs (*ovdan*), dwellings, utility buildings, tombs, mausoleums, burial mounds and ruins of fortifications, all preserved to date. The historical ambience of the 3rd millennium BC is well preserved there due to its distance from Baku and other villages which left this area little known up to middle of the 20th century.

Some erections preserved in this village are of the unicameral type (Figs. 15a-b). Mostly, however, houses consist of two rooms: one was used as a living room, another one as a kitchen (Fig. 16). Some houses consisted of many rooms (Figs.17a-b) with an oven for bread baking (tendir), as well as a fireplace located in the kitchen for food preparation and the heating of water. The presence of a *tendir* and fireplace led to the appearance of double (twin) cone-shaped cupolas with upper apertures (Figs. 18a-b).

There is a peculiar water course in the corner of one of the rooms. The water course in the form of a deep channel was constructed at floor level and does not have any partition from the kitchen. Opposite the water course there is small platform surrounded by a low wall (15-20 cm) connected to building. A hole on the platform surface drains the water toward to the street. Rainwater was used for washing and the Islamic ritual lavabo (*gusul*) before prayer. One could mention that this was a unique element, a prototype of the modern shower cabin in the medieval houses of Gala citizens. Not simply a bath house, which were widespread in the East, but precisely a shower cabin,

[3] The Gala Village was proclaimed State Historically-Ethnographical Preserve by order n° 457, by Azerbaijan Ministers Cabinet in 1988.

where people were washed 5 times a day before prayer. One other interesting feature is that, in spite of the enfilade of rooms, each room has its own gate to the yard.

In reference to investigations, twin-dome houses appeared as the result of further development of the semi-underground domed utility building, usually dug into the earth 2-2.5 meters or placed at ground level. Interiors are of particular interest: there are special feedboxes and stone fastenings to the walls for animals. It is necessary to note that houses situated in the area surrounding a cemetery are also of special interest. The type of building contributes to temperature reduction inside the house: a dome shape, compared to a flat roof, contributes to reduced heating of the overlapping and faster cooling.

Materials and building techniques

Houses in Gala were constructed from white limestone (Figs. 19-21). They usually have domes over ovens, smoke ducts and stone rainwater leaders. According to Atakishiyev K. (Aliyeva R. 2007, p. 73) "these are the first *garadams* in stone." "In many Azerbaijan regions, *garadams* were constructed from wood, but here, in Absheron, lack of wooden and abundance of stone materials created a new type of stone garadam. We may find such houses only in Absheron (within Azerbaijan)" (Aliyeva R. 2007, p. 4).[4]

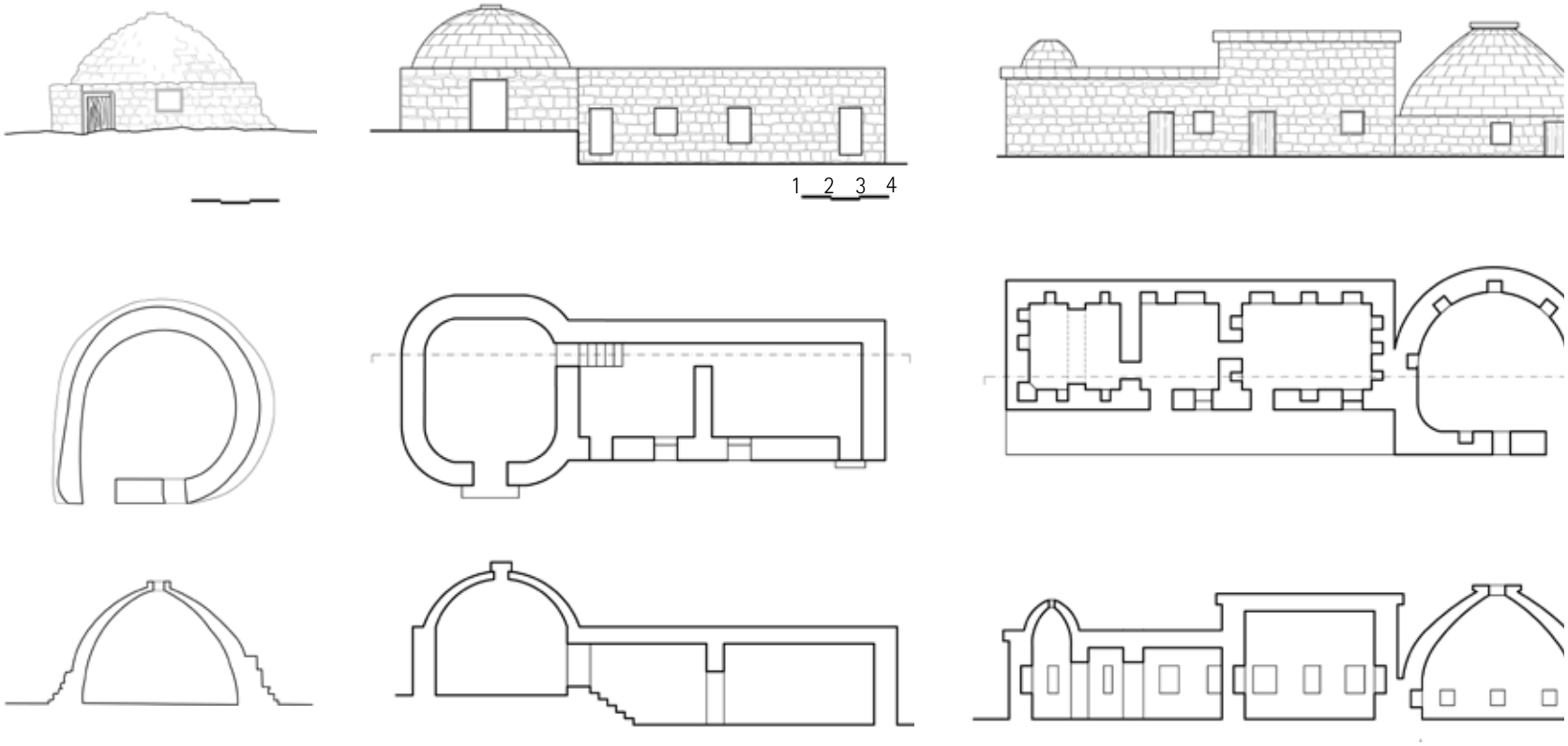
Architrave beam-type construction was used as an overlapping structure in corbelled erections. Architrave structures through trumpet arches cover all the space over walls, forming a cupola.

There are several types of overlapping constructions:

- The *Arch structure*, which transfer the vertical and horizontal load to the walls. Walls are of 70-90 cm thickness to maintain the inner microclimate and are constructed in clay mortar. The floor is stone or of clay and thatch mix.
- The *flat post-and-beam structure* is very rare. It consists of wooden beams with clay laid down over a clay and thatch overlapping.

[4] Kepfer, European traveler of 17th century, gives some ethnographical features of Gala village (Aliyeva R. 2007, p. 4); Zelenskiy, Lerkh and Berezin write in their works about village. Drawings of Pakhomov and Csheblikin are of special interest.

Fig. 15a: Houses in Gala Village, unicameral type
Fig. 16: Houses in Gala Village, bi-cameral type
Fig. 17a: House in Gala Village, double-domes type
Fig. 18: House in Gala Village, tendir and fireplace corresponding to the double (twin) cone-shaped domes with upper apertures



- *Mix roof from arch and post-and-beam structure*. The existence of several overlapping systems does not influence the exterior of the building. However, it can sometimes be seen in the different height of the rooms.

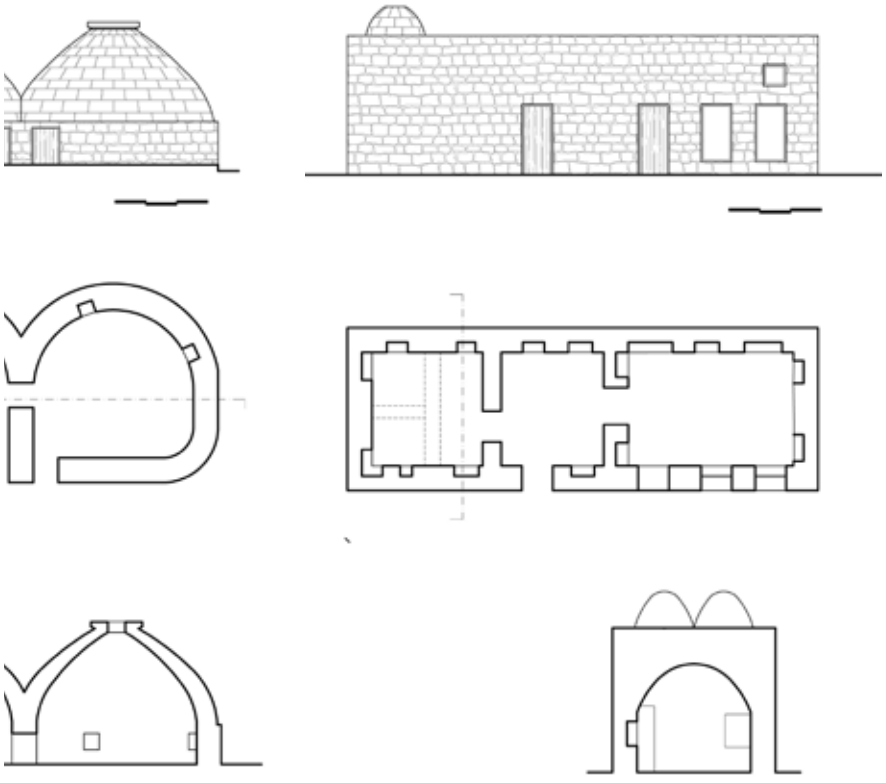
Interiors are also of special interest. There were wooden niches, shelves or *ref*, on the upper part of the walls as decorative elements. Cups, copper tableware, trays and such were put on the shelves. Chests, mattresses and blankets were put into niches and act as so-called interior decoration. Lamps and small niches for the Koran are other decorative elements.

New houses were constructed later, at the end of the 19th and beginning of the 20th centuries. Those were houses with many rooms, integrated to old houses (mostly houses of affluent people or large families); new two-storeys houses; and one-storey houses with many rooms and twin cupolas (as result of traditional house development).

Evaluation of the state of conservation and pathologies

Gala corbelled buildings are of special interest as rare types. Their layout peculiarities demonstrate a genetical connection to ancient *garadam* houses, but at the same time have their own originality and uniqueness. Unfortunately there is a lack of preservation and rehabilitation of the houses as much as the historical ambience around them. Some architectural monuments, well known from previous investigations conducted 20-30 years ago, no longer exist. Many have lost their originality as a result of incorrect restoration or repair works.

On the initiative of the Foundation Heydar Aliyev, the first historical-ethnographical open-air museum complex was founded in Gala in 2008, a move to promote the preservation of the monuments of Gala.



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